A.D. 1869, 3rd JULY. N° 2016.

SPECIFICATION

OF

JOHN HART.

SEPARATING, DISTRIBUTING, AND UTILIZING SEWAGE.

LONDON:
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A.D. 1869, 3rd JULY. N° 2016.

Separating, Distributing, and Utilizing Sewage.

LETTERS PATENT to John Hart, of Leamington, in the County of Warwick, for the Invention of "IMPROVEMENTS IN THE MEANS OF AND APPARATUS FOR SEPARATING, DISTRIBUTING, AND UTILIZING SEWAGE."

Sealed the 1st January 1870, and dated the 3rd July 1869.

PROVISIONAL SPECIFICATION left by the said John Hart at the Office of the Commissioners of Patents, with his Petition, on the 3rd July 1869.

I, JOHN HART, of Leamington, in the County of Warwick, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE MEANS OF AND APPARATUS FOR SEPARATING, DISTRIBUTING, AND UTILIZING SEWAGE," to be as follows:—

This Invention relates to certain improvements in the means of separating the liquid and solid portions of sewage, and of distributing the same; also in the apparatus whereby such objects are effected. The system is chiefly applicable for use in the neighbourhood of cities or large towns surrounded by land under cultivation to which the sewage can be usefully applied, but it may be used in other localities, from which the solid matter may be collected and conveyed to a distance,

while the liquid is allowed to flow in an inoffensive state into the nearest river or the ocean. The apparatus is to be constructed at such an elevation and in such a situation as to ensure the distribution of sewage by the power of gravity, and to avoid deleterious results to health; for these reasons the sewage matter is to flow by gravitation or be forced from the town or city by means of pumps to the separating apparatus, which consists of a series of concentric rings of brick or stone work or other material combined or not with iron, the central being elevated or not above the others, and so on throughout the series to the outermost ring, the supply pipe entering beneath the inner or central ring or reservoir, which when filled allows the liquid to flow over into the second concentric reservoir, and thus consecutively to the outermost ring, beyond which the liquid escapes in a thin sheet on to the surrounding land. Now it will be evident that in this continuous flow a deposit of solid particles of sewage will take place in each reservoir, and that ultimately the liquid manure alone will escape beyond the system of reservoirs; and it is proposed to still further purify this liquid by allowing it to flow over a plot of land in which rye grass is grown, and then apply it to turf land, or discharge it into a river or the sea, or otherwise to apply it to arable land without the intermediate process of purification by contact with the crop of rye grass. After a sufficient time has elapsed to charge the reservoirs with solid deposits they are to be cleansed by scrapers or other suitable means, and the deposits spread in thin layers on earth with which they are to be mixed, thus deodorizing them and forming a compound which becoming more impregnated with fertilizing matter at each repetition of the process forms a valuable manure. By this system no chemicals are required to treat the sewage matters, since the large area of shallow liquid exposed to the influence of the air accomplishes the purifying and disinfecting objects necessary to be effected in all sewage manures.

As a modification of the system of concentric reservoirs or receptacles it is proposed to form them on one and the same level, but in general practice a difference in elevation would be preferable. In the culvert conveying the sewage to the reservoir a grating should be fixed of a larger area than the main culvert, for the purpose of arresting large masses of sewage and allowing them to be removed. This is accomplished by interrupting the main culvert with an enlarged circular or square casing, in the centre of which the grating is fixed; thus the liquid and small solid particles are allowed to flow through to the

reservoir, while the larger masses are stopped and settle down in the well or lowest part of the casing, whence they are drawn out through an opening by means of a rake, bucket, or dredger, and then placed in a receiver on the top of the culvert, and allowed to flow in the reservoirs. By regulating the rapidity of the supply of sewage containing liquid and solid matter to the reservoirs the overflow may consist of liquid only, or it may contain any desired proportion of solid matter as required, and in order to convey the same to the distant fields shallow channels are cut by means of a plough or similar cutting apparatus in the requisite directions, taking advantage of the undulations of the land, but an incline of one foot in a hundred or a hundred and fifty will be found ample, and where the nature of the land permits these channels should be formed in rings, ovals, or spirals, so as to always cause the flow of the sewage, or direct channels may be cut for some distance communicating with diverging branches. On turf land the sewage can be conveyed along corrugations formed by cutting turfs of varying thickness and re-laying them in a reversed position, so that the liquid may be confined by undulations of the surface of so slight a character as to form no impediment to mowing or grazing, and so strong as not to be readily damaged by weather, or by the passage of cattle over them. By these means the farmer may receive a supply of manure on any portion of his land by stopping the course or flow along one channel and diverting it to another at pleasure. In treating the heaps or mounds of solid manure collected as deposits from the reservoirs it will only be necessary to mix common earth with the deposit; this should be done as it is removed from the reservoirs, so as to permit the atmosphere to deodorize the mass. It will be desirable if the flow of sewage to the reservoir is constant to construct a second one close to or near the first, and to divert the flow from one to the other according as one becomes charged with deposit which it is necessary to remove, so also in the event of floods the two reservoirs could be used at the same time.

The main features of this Invention it will be observed are that the system of separating and distributing the manure is chiefly self-acting, the separation of the liquid and solid matters being the result of a slow, continuous, and steady flow of sewage over the ledges of the concentric reservoirs, whereby a settlement of solid matter is necessarily the result. The deodorizing of the manure is effected solely by atmospheric influence, which is always acting on the reservoir by reason of its great superficial exposure and the shallowness of the annular receptacles. All machinery

and moving parts are dispensed with, and therefore there is nothing to get out of order, all that is necessary is to adjust the supply or divert the same from one reservoir to the other, and this can be done by an ordinary two-way cock placed at the junction of the main tube with the two branches to the reservoirs. The channels for conveyance of the manure on the arable land may be readily formed by means of a plough. Assuming the transverse section of the channel to be cut on a level with a longitudinal descent, two furrows with external ridges should be cut, leaving an intervening space; it would then follow that if the two angular cuttings penetrated six inches the two ridges would be raised six inches above the level, giving a total depth in each furrow of twelve inches, and a depth of six inches above the intervening level uncut. Thus the main body of the manure would flow through or along the largest or upper part of the channel, which is of course above the original level of the land and between the raised ridges. Assuming that the cross section of the land should be sloping, one furrow and outer ridge only need be formed on the surface; the channel would then be limited according to its depth on one side to the internal edge or surface of the ridge, and on the other to a margin where the level of the manure reached the corresponding level of the sloping ground. So also on a level cross section of land two furrows may be cut close together leaving external ridges; thus the apex of the internal ridge would be the original level, and the two outer raised ridges would form the width of the channel. On land consisting of barreled shaped undulations the divisions between them would serve as main channels, and a series of angular cuttings should be made extending midway across the divisions of land, meeting in the centre, by which means the manure could be conveyed over the entire surface. All these methods of forming channels are suitable for the circular, oval, spiral, or irregular arrangements of channels mentioned according to their cross section.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said John Hart in the Great Seal Patent Office on the 3rd January 1870.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, John Hart, of Leamington, in the County of Warwick, send greeting.

Hart's Improvements in Separating, Distributing, and Utilizing Sewage.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Third day of July, in the year of our Lord One thousand eight hundred and sixty-nine, in the thirty-third year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said John Hart, Her special licence that I, the said John Hart, my executors, administrators, and assigns, or such others as I, the said John Hart, executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN THE MEANS OF AND APPARATUS FOR SEPARATING, DISTRIBUTING, AND UTILIZING SEWAGE," upon the condition (amongst others) that I, the said John Hart, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John Hart, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

My Invention relates to certain improvements in the means of separating the liquid and solid portions of sewage, and of distributing and utilizing the same; also in the apparatus whereby such objects are effected. The system is chiefly applicable for use in the neighbourhood of cities or large towns surrounded by land under cultivation to which the sewage can be usefully applied, but it may be used in other localities, from which the solid matter may be collected and conveyed to a distance, while the liquid is allowed to flow in an inoffensive state into the nearest river or the ocean. The apparatus is to be constructed at such an elevation and in such a situation as to ensure the distribution of sewage by the power of gravity, and to avoid deleterious results to health; for these reasons the sewage matter is to flow by gravitation or be forced from the town or city by means of pumps to the separating apparatus, which consists of a series of con-

centric rings of brick or stone work or other material combined or not with iron, the central ring being elevated or not above the others, and so on throughout the series to the outermost ring, the supply pipe entering beneath the inner or central ring or reservoir, which when filled allows the liquid to flow over into the second concentric reservoir, and thus consecutively to the outermost ring, beyond which the liquid escapes in a thin sheet on to the surrounding land. Now it will be evident that in this continuous flow a deposit of solid particles of sewage will take place in each reservoir, and that ultimately the liquid manure alone will escape beyond the system of reservoirs, and it is proposed to still further purify this liquid by allowing it to flow over a plot of land in which rye grass is grown, and then to apply it to turf land, or discharge it into a river or the sea, or otherwise to apply it to arable land without the intermediate process of purification by contact with the crop of rye grass. After a sufficient time has elapsed to charge the reservoirs with solid deposits they are to be cleansed by scrapers or other suitable means, and the deposits spread in thin layers on earth with which they are to be mixed, thus deodorizing them and forming a compound which becoming more impregnated with fertilizing matter at each repetition of the process forms a valuable manure. By this system no chemicals are required to treat the sewage matters, since the large area of shallow liquid exposed to the influence of the air accomplishes the purifying and disinfecting objects necessary to be effected in all sewage manures.

As a modification of the system of concrete reservoirs or receptacles it is proposed to form them on one and the same level, but in general practice a difference in elevation would be preferable. In the culvert conveying the sewage to the reservoir a grating should be fixed of a larger area than the main culvert, for the purpose of arresting large masses of sewage and allowing them to be removed. This is accomplished by intercepting the main culvert with an enlarged circular or square casing, in the centre of which the grating is fixed; thus the liquid and small solid particles are allowed to flow through to the reservoir, while the larger masses are stopped and settle down in the well or lowest part of the casing, whence they are drawn out through an opening by means of a rake, bucket, or dredger, and then placed in a reservoir on the top of the culvert, and allowed to flow into the reservoirs. By regulating the supply of sewage containing liquid and solid matter to the reservoirs the overflow may consist of liquid only, or

it may contain any desired proportion of solid matter as required, and in order to convey the same to the distant fields shallow channels are cut by means of a plough or similar cutting apparatus in the requisite directions, taking advantage of the undulations of the land, but an incline of one foot in a hundred or a hundred and fifty will be found ample, and where the nature of the land permits these channels should be formed in rings, ovals, or spirals so as to always cause the flow of the sewage, or direct channels may be cut for some distance communicating with diverging branches. On turf land the sewage can be conveyed along corrugations formed by cutting turfs of varying thickness and re-laying them in a reversed position, so that the liquid may be confined by undulations of the surface of so slight a character as to form no impediment to mowing or grazing, and so strong as not to be readily damaged by weather or by the passage of cattle over them. By these means the farmer may receive a supply of manure on any portion of his land by stopping the course or flow along one channel and diverting it to another at pleasure. In treating the heaps or mounds of solid manure collected as deposits from the reservoirs it will only be necessary to mix common earth with the deposit; this should be done as it is removed from the reservoirs so as to permit the atmosphere to deodorize the mass. It will be desirable if the flow of sewage to the reservoirs is constant to construct a second one close to or near the first, and to divert the flow from one to the other according as one becomes charged with deposit which it is necessary to remove, so also in the event of floods the two reservoirs could be used at the same time.

The main features of this Invention it will be observed are that the system of separating and distributing the manure is chiefly self-acting, the separation of the liquid and solid matters being the result of a slow, continuous, and steady flow of sewage over the ledges of the concentric reservoirs, whereby a settlement of solid matter is necessarily the result. The deodorizing of the manure is effected solely by atmospheric influence, which is always acting on the reservoir by reason of its great superficial exposure and the shallowness of the annular receptacles. All that is necessary is to adjust the supply or divert the same from one reservoir to the other, and this can be done by an ordinary two-way cock placed at the junction of the main tube with the two branches to the reservoirs. The channels for conveyance of the manure on the arable land may be readily formed by means of a plough.

Hart's Improvements in Separating, Distributing, and Utilizing Sewage.

Assuming the transverse section of the channel to be cut on a level with a longitudinal descent, two furrows with external ridges should be cut, leaving an intervening space; it would then follow that if the two angular cuttings penetrated six inches the two ridges would be raised six inches above the level, giving a total depth in each furrow of twelve inches, and a depth of six inches above the intervening level uncut. Thus the main body of the manure would flow through or along the largest or upper part of the channel, which is of course above the original level of the land and between the raised edges. Assuming that the cross section of the land should be sloping, one furrow and outer ridge only need be formed on the surface; the channel would then be limited according to its depth on one side to the internal edge or surface of the ridge, and on the other to a margin where the level of the manure reached the corresponding level of the sloping ground. So also on a level cross section of land two furrows may be cut close together leaving external ridges; thus the apex of the internal ridge would be the original level, and the two outer raised ridges would form the width of the channel. On land consisting of barreled shaped undulations the divisions between them would serve as main channels, and a series of angular cuttings should be made extending midway across the divisions of land, meeting in the centre, by which means the manure could be conveyed over the entire surface. All these methods of forming channels are suitable for the circular, oval, spiral, or irregular arrangements of channels mentioned according to their cross section; and pipes may be laid down where necessary.

The form of apparatus first described is shewn in Figs. 1 and 2; Fig. 1 being a section, and Fig. 2 a plan, the same letters referring to similar parts in both. For the sake of clearness a small apparatus suitable for a district containing about one thousand inhabitants is chosen for illustration.

A level circular bed *a* of concrete, brick, or other similar material, sixty-three feet in diameter is prepared; under this, and rising with a bend through its centre, is laid an iron pipe *b* connected with the outfall sewer of the district, from which it is supplied by gravitation or pumping. In the latter case the end of this pipe is furnished with a projecting hood or covering for breaking the force of the pressure put upon the liquid. Round this inlet are formed three concentric circular

walls *c*, *d*, *e*, six inches high and two feet three inches thick, having their upper surfaces true and level and an annular space nine feet wide between each. These dimensions admit of a slight variation to suit the sizes of bricks obtainable in the locality. As sewage in the state in which it flows from a town generally contains much floating matter that would interfere with subsequent treatment, it is necessary to remove this as the first step. For this purpose the outfall culvert near its mouth is widened and deepened to form an intercepting trap; in this is placed an iron grating, through which small particles flow with the liquid. The larger ones are stopped, and either settle into the lowest part of the trap, or float and rest against the bars of the grating. The former are removed by a dredger and the latter by a rake, and are placed in separate receivers over the culvert to be drained, and utilised with the refuse obtained from the next part of the process. After passing this intercepting trap the sewage is admitted to the purifier by opening a penstock; it then flows from the inlet *b* in every direction, until it meets with a check at the first circular wall *c*. As the area of this circle is so much greater than that of the inlet pipe, the fluid in its tendency to gain a level spreads and becomes tranquilised whatever its disturbance may be on issuing from the pipe. The process of precipitation, when not hastened by artificial means, being a slow one commencing from above, it is found at this early stage that the heaviest matters only have been deposited in the first annular compartment, and the upper part of the liquid is comparatively clear, though still containing much matter in a minutely divided state. In its steady flow over the broad surface of the wall *c* separating the first and second compartments the sewage gives off gaseous impurities, and (its rate of progress decreasing as it advances) passes into the second compartment. Here the precipitation is carried on with more marked effect than in the central division, and the clearest or upper portion of the liquid is passed over the second wall *d*, this time in a still shallower body. The processes of exposure to the air and depositing solids are repeated in a slower and more efficient manner in the outer compartment. The liquid then trickles into a channel *f* formed by a ridge of clay about an inch high leading to the nearest suitable piece of land for completing the purifying process. It is now for practical purposes clear and free from smell, but before allowing it to flow into a river the remaining soluble impurities may be removed by passing it over a meadow or a plot of ground sown with some fast growing vegetation.

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For the purpose of cleansing the accumulated deposit from the compartments it is necessary (unless the apparatus is constructed in duplicate with connections for allowing them to be simultaneously worked in wet weather) to divide the two outer compartments by radiating walls *g*, *h*, *i*, each about four and a half inches thick and as high as the circular divisions; one portion may then be cleansed without interfering with the operation of the remainder. Openings or gaps *j* about fourteen inches wide are left in the two outer circular walls for draining off one section at a time, and a small roll of clay placed along the top of the radiating walls prevents water from flowing into the portion being cleansed. These openings when not used for draining off the water remain closed by clay dams. Fig. 3 shews a plan and Fig. 4 a section of one of them on an enlarged scale. *a* is the clay dam; *b*, a moveable metal plate carefully fitted to the opening, with its upper surface flush with the top of the circular dividing wall, of which it virtually forms a continuation, for the purpose of exposing the liquid passing over it. By means of these openings it is possible to run off impure sewage from one part of the apparatus while the other part is in operation, as usual; such a method may be desirable for a short time under certain circumstances, though generally the openings all remain closed, except at the periods of cleansing. The sediment when wheeled out is at once placed in a layer not more than two inches thick on ground that has been prepared by digging to a depth of at least sixteen inches. A trench wide enough for a man to work in having been formed at one side of this ground the whole depth of loose earth and the layer of deposit on it are mixed by being turned over, the result being that anything likely to cause offensive odours is completely deodorized; the earth remains loose until another layer of sediment is placed upon it; and these processes are repeated time after time until the mass becomes so enriched as to be saleable as a manure. Coal ashes and other refuse can be used as deodorizing agents; they cannot, perhaps, be put to a better use, and are generally to be obtained in abundance in crowded districts. In Fig. 2, *k* shews one of the heaps of deodorized deposit, with the mixing in progress, and a barrow run or traversing tramway laid from the centre of the apparatus.

The suggestion may arise that the removal of the impurities from sewage may diminish its fertilizing qualities, and this is no doubt true, but is of little consequence, as the main object now in view is the pre-

vention of the pollution of rivers. It has been proved, however, that rye grass (the crop usually selected for the purpose) can be as successfully grown when plentifully supplied with river water as when irrigated with sewage containing all its impurities.

In contradistinction to most other systems this provides that the sewage under treatment shall never be allowed to stagnate or even to be completely at rest; but from issuing from the inlet pipe until leaving the vegetation in a state approximating to purity a slow continuous action is going on, during which noxious matters are eliminated before they have time to produce fermentation, which state, if allowed to set in, is a fruitful source of mischief.

In constructing an apparatus of larger size than that shewn in Fig. 2, the number of concentric divisions should be increased, still keeping up the proportion of about four times the width of the separating walls. By these means, whatever the speed with which the sewage is delivered, there is the same opportunity of lengthened exposure and complete separation of impurities as in the small apparatus.

It should be observed that for general purposes the proportions of purifying and irrigating surfaces before mentioned are such as prove efficacious in average districts where a moderate quantity of land is readily obtainable. These proportions, however, are far from being absolute in their relation to one another, but admit of considerable modification to suit special circumstances. For instance, it may be impossible to procure a sufficiently large area of land; in such a case the remedy is to increase the area devoted to exposure (which may be done to the extent of six superficial feet per head with advantage), and to rely on that part of the process exclusively, the liquid being allowed to flow from the outer wall of the purifier on to an annular surface of asphalte or concrete, as shewn on plan in Figs. 2 and 3, and in section on Fig. 4. This space has an internal diameter equal to the outside of the purifier, and its width is such as to form an area as great as the central apparatus, and large enough to carry out the principle of exposure to its extreme limit of usefulness. A slightly elevated margin confines the liquid and controls its flow, so that it may be collected at one outlet in any part of the circle, and be led into the stream selected for its ultimate destination.

This modification is suitable on a small scale for isolated factories, dye works, unions, barracks, and similar establishments that are not connected with any general system of drainage and are now pouring their refuse into canals or rivers.

Referring to Figs. 3 and 4, there will be noticed a pipe drain laid under the surface from the outside of the purifier; the use of this is to take the sewage (when the gaps are open) beyond the plot of rye grass to a feeder outside it for use on arable land; one of these drains is laid from the outside of each radial compartment of the purifier. The use of one, two, or all of these is suspended during the time that a part or the whole of the purifier is occupied with the preparation of sewage for grass land. An outlet to lower ground is provided from the outer end of each of the drains to run them dry when not in use, and to get rid of the deposit that may accumulate in them. Another use to which the gaps may be applied is that of disposing of the sediment that lodges in the purifier without the necessity of emptying each division by hand labour. This can be done (when arable land in the vicinity is in a state to receive sewage containing more than its usual amount of impurity) by leaving the gaps open, and allowing the flow from the centre of the purifying apparatus to carry with it the solid matter that has collected in the ordinary course. One radial compartment at a time can thus be cleansed, and the deposit either dispersed with the liquid, or the whole may be run on to a small space, where being confined by a ridge the liquid overflows and is conducted to the land as usual, and the solid remains until dry and capable of easy removal. The spot on which this process is conducted can also be made another centre of distribution for supplying the land contiguous to it. Waste ground can be brought into culture and sufficient solid matter deposited and incorporated with the soil as in a short time to make an appreciable difference in its depth and add greatly to its fertility.

It will be apparent that by the means pointed out power is given to supply sewage, either impure as it flows from a sewer, or with its offensive matters partially or wholly removed. The apparatus can be entirely devoted to one process or partly to both at the same time; more perfect command of the subject is thus obtained than has hitherto been achieved, even by the use of expensive and complicated means.

Fig. 5 shews part of a plan, and Fig. 6 a section of a part of a

purifying apparatus within an enclosure, and adapted for use among market gardens or on a barren spot that it is desired to fertilize. The circumscribing wall *a* screens the works from view, and encloses a raised border of ground *b* maintained in a high state of fertility by the free use of the solid deposit taken out of the purifier. The space between the outer ring of the apparatus and the border becomes an additional exposing and purifying area, of which a part or the whole may be used as occasion demands. The inner portion *c* is formed of asphalte or similar material, and the outer part *d* is paved and used as a road for collecting and disposing of the surplus manure. Pipe drains *e* with upright shafts *f* governed by valves convey the liquid under the wall and border to the outer garden, where as much as is needed in the immediate vicinity is allowed to flow on to the surface of a paved or asphalted path *g* running entirely round the wall at some distance from it. A small semicircular depression in this path confines the liquid within bounds, and a temporary roll of clay diverts it to any part of the garden. The land being well drained and supplied with large quantities of sewage in addition to the periodical application of solid manure can be profitably devoted to the production of early and abundant crops of vegetables. The circular boundary affords a large space that can be used for the culture of wall fruit. The liquid not wanted in the immediate neighbourhood may be conveyed a long or short distance either on the surface or in underground pipes until land of a nature to be benefited by its application is reached. At the mouth of large outfall sewers, or at any part of their course where the extracted matter can be made available, an elevator may be introduced to supersede the dredging and raking described heretofore in connection with the intercepting trap or receiver of a small culvert. In a large sewer a convenient addition is found in a pair of spindles set in bearings at right angles to the course of the stream in the widest part of the structure, the lower one near to the bottom and the upper one above the surface of the ground. These spindles each carry two square or polygonal frames or discs, shewn in Figs. 7 and 8 at *a*, acting as wheels to give motion to endless chains composed of links each of the length of one side of the square or polygon. To these links are attached galvanized wire frames of netting of about a quarter of an inch mesh, and on the edge of each alternate link is formed along the whole of its length a galvanized iron scoop or bucket *b*. The machinery is driven by a wheel impelled by the current, or the upper spindle is

worked by hand or geared to any other power. The nettings though moving with the links have the same effect as a fixed screen; the scoops connected with them in their movement round the lower spindle bring up the sediment from the bottom, and on emerging from the liquid also raise the light matters stopped by the nettings. Both are brought to the surface, and by a motion similar to that of a chain pump are discharged into a trough *c* with a perforated bottom, where the liquid drains off and leaves the other matters in a state easily dealt with. A wooden float *d* for stopping the scum with a provision for raising and cleaning it completes all that is necessary in connection with this structure.

Having now described the nature of my said Invention, and the manner in which the same is to be performed, I would remark in conclusion that I do not restrict myself to the precise details and configuration of parts which I have expressed and shewn, as the same may be varied or modified according to the particular circumstances under which the Invention may be applicable, and to the varying descriptions of land whether pasture, arable, or both combined, or to land of any kind under cultivation or not, the system admitting of many modifications without in any degree changing or departing from its general principles; but what I claim and desire to be secured to me by the herein in part recited Letters Patent are, the improved means and apparatus whereby sewage matters are collected, separated, purified, distributed, and utilized by a self-acting system, substantially in the manner specified herein and partly shewn by the Drawings hereunto annexed.

In witness whereof, I, the said John Hart, have hereunto set my hand and seal, this Eighteenth day of November, in the year of our Lord One thousand eight hundred and sixty-nine.

JOHN HART. (L.S.)

Witness,

GEORGE HART.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1870.

AD 1869, JULY 3, Nº 2016,
HART'S SPECIFICATION.

FIG. 1.

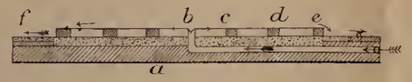


FIG. 2.

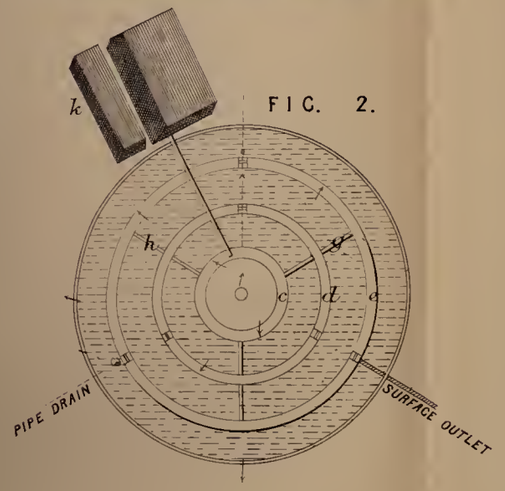


FIG. 3.

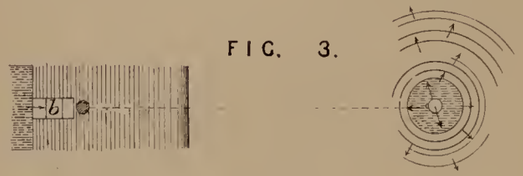


FIG. 4.

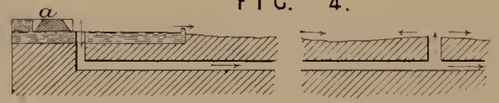


FIG. 6.

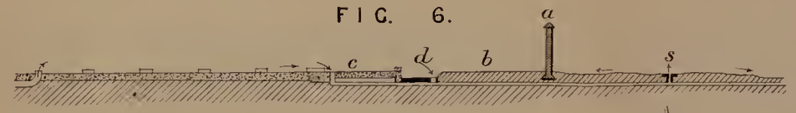


FIG. 5.

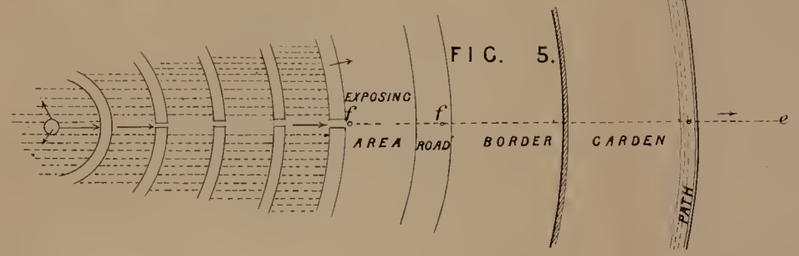


FIG. 7.

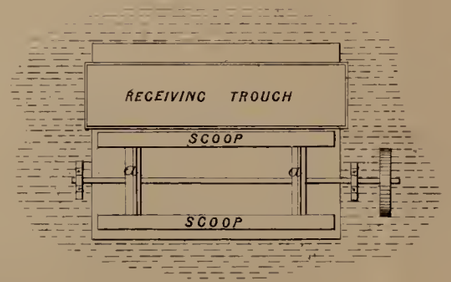
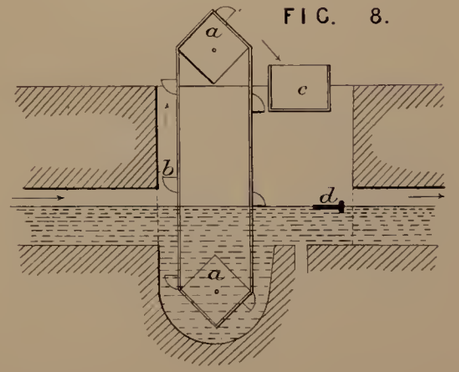


FIG. 8.



The filed drawing is not colored.

Drawn on Stone by Malby & Sons.

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